NASA TECH BRIEF
Ames Research Center

Ultraviolet and Thermally Stable Polymer Compositions

The problem:

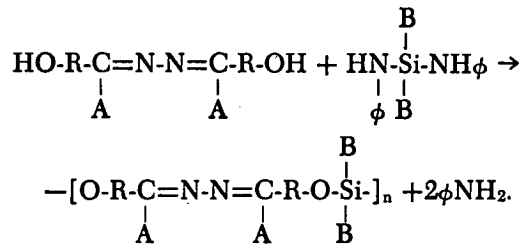
To develop polymers which are thermally stable and are not degraded by solar ultraviolet light of wavelengths shorter than those reaching the earth's surface.

The solution:

A new class of aromatic and substituted aromatic azine – siloxane copolymers.

How it's done:

The polymers are prepared by allowing a dihydroxyarylazine monomer to react under typical melt polymerization conditions with bis(anilino)-diaryl- or dialkylsilane monomer; the course of the condensation can be followed by collecting and measuring the aniline which is evolved:



In the above equations, R represents a substituted aromatic group or condensed aromatic ring system, A represents a hydrogen atom, an alkyl radical, or an aryl radical, and B represents a phenyl or methyl radical.

Examples of suitable hydroxyarylazines include 4,4′-dihydroxy-1,1′-benzalazine, 2,2′-dimethoxy-5,5′-dihydroxy-1,1′-benzalazine, and 2,2′,6,6′-tetrahydroxy-1,1′-naphthalazine. Generally, the azines are prepared by allowing an ethanolic solution of the appropriate aldehyde to react with a solution of hydrazine sulfate in a nitrogen atmosphere.

Examples of bis(anilino)-diaryl- or dialkylsilyl amines that are suitable for the formation of copolymers include bis(anilino)diphenylsilane, bis(anilino)-dimethylsilane, and bis(anilino)phenylmethylsilane. These compounds may be prepared by allowing aniline to react with the appropriate alkyl or aryl dichlorosilane in the presence of 2,4,6-trimethylpyridine.

A typical copolymer, formed from 2 moles (1 part by wt.) of 4,4′-dihydroxybenzalazine and 3 moles (2.2 parts by wt.) of bis(anilino)diphenylsilane, is poly-4,4′-(diphenylsiloxy)benzalazine; the crude polymer is dissolved in chloroform and purified by precipitation with methanol. The pure polymer is yellow and not brittle; it can be used as a cement for glass (heat 30 minutes at 190°C to melt). It can be cast as a plastic film from chloroform or tetrahydrofurane solutions and parts can be fabricated by compression molding.

The thermal and ultraviolet stability of the copolymers stems from their basic chemical composition, that is, the presence of repeating mer units of an aromatic azine and an aromatic diphenylsilane, both units independently exhibiting exceptional thermal and ultraviolet stability.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: TSP 72-10709

(continued overleaf)

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

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